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SOLAR/1012-78/12

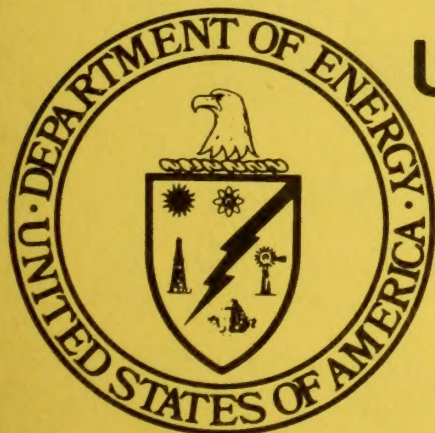
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Monthly Performance Report

J. D. EVANS

HOUSE A

DECEMBER 1978



U.S. Department of Energy

National Solar Heating and
Cooling Demonstration Program

National Solar Data Program

NOTICE

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MONTHLY PERFORMANCE REPORT

J. D. EVANS INC.
HOUSE A

DECEMBER 1978

I. SYSTEM DESCRIPTION

The J. D. Evans House A is one of two instrumented single-family residences in Columbia, Maryland. The home has approximately 2250 square feet of conditioned space. Solar energy is used for space heating the home and preheating domestic hot water (DHW). The solar energy system has an array of flat-plate collectors with a gross area of 350 square feet. The array faces south at an angle of 45 degrees to the horizontal. Water is the transfer medium that delivers solar energy from the collector array to storage and to the space heating and hot water loads. Solar energy is stored in the basement in a 1000-gallon steel storage tank. Incoming city water is preheated in a liquid-to-liquid heat exchanger located in the storage tank and then flows into a conventional 40-gallon DHW tank. When solar energy is insufficient to satisfy the space heating load, a heat exchanger within a heat pump and an electrical heating element in the air-distribution duct provides auxiliary energy for space heating. Similarly, an electrical heating element in the DHW tank provides auxiliary energy for water heating. The system, shown schematically in Figure 1, has three modes of solar operation.

Mode 1 - Collector-to-Storage: This mode activates when the temperature difference between the storage tank and the collector outlet is higher than 15°F. Water circulates from the storage tank through the collector until a temperature difference of less than 5°F is reached.

Mode 2 - Storage-to-Space Heating: This mode activates when thermal energy for space heating is requested by the room thermostat. Solar-heated water from storage circulates through a liquid-to-air heat exchanger in the space heating air duct. If solar energy is insufficient to satisfy the space heating load requirement, the heat pump and/or the auxiliary electrical heating element will be activated. The electrical strip heater can also be manually operated without solar heating and heat pump operation.

Mode 3 - DHW Preheating: This mode is activated by drawing hot water from the system. Cold supply water is preheated in a liquid-to-liquid heat exchanger located in the storage tank before flowing to the DHW tank. If the required DHW tank temperature is not maintained by solar preheating, auxiliary energy is provided by the electrical heating element in the DHW tank.

II. PERFORMANCE EVALUATION

INTRODUCTION

The solar energy system operated to collect and store solar energy and to provide DHW preheating and space heating throughout the month of December.

The daily average incident solar energy was lower, and the average ambient temperature was higher than the respective long-term averages for the month of December. The solar energy system satisfied 22 percent of the DHW and 28 percent of the space heating requirements.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 11.6 million Btu for a daily average of 1071 Btu per square foot. This was below the estimated average daily solar radiation for this geographical area during December of 1139 Btu per square foot for a south-facing plane with a tilt of 45 degrees to the horizontal. The average ambient temperature during December was 37°F as compared with the long-term average for December of 35°F.

THERMAL PERFORMANCE

Collector The total incident solar radiation on the collector array for the month of December was 11.6 million Btu. During the period the collector loop was operating, the total insolation amounted to 9.7 million Btu. The total collected solar energy for the month of December was 3.9 million Btu, resulting in a collector array efficiency of 34 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 3.9 million Btu. Operational energy required by the collector loop was 0.19 million Btu.

Storage - Solar energy delivered to storage was 3.9 million Btu. There were 3.3 million Btu delivered from storage to the DHW and space heating subsystems. Energy loss from storage was 0.6 million Btu. This loss represented 18 percent of the energy delivered to storage. The storage efficiency was 82 percent: This is calculated as the ratio of the sum of the energy removed from storage and the change in stored energy, to the energy delivered to storage. The average storage temperature for the month was 92°F.

DHW Load - The DHW subsystem consumed 0.11 million Btu of solar energy and 0.5 million Btu of auxiliary electrical energy to satisfy a hot water load of 0.48 million Btu. The solar fraction of this was 22 percent. Losses from the DHW subsystem were 0.13 million Btu. The DHW subsystem did not consume any operating energy, resulting in an electrical energy savings of 0.11 million Btu. A daily average of 21 gallons of DHW was consumed at an average temperature of 142°F delivered from the tank.

Space Heating Load - The space heating subsystem consumed 3.2 million Btu of solar energy and 3.9 million Btu of auxiliary electrical energy to satisfy a space heating load of 11.5 million Btu. The heat pump supplied 8.4 million Btu of energy. The solar fraction of the space heating load was 28 percent. The space heating subsystem consumed a total of 0.76 million Btu of operating energy, resulting in an electrical energy savings of 1.8 million Btu. The average ambient temperature inside the house was 68°F.

OBSERVATIONS

The electrical energy savings for the space heating subsystem were determined based on conventional heating using a heat pump.

ENERGY SAVINGS

The solar energy system provided a net electrical energy savings of 1.7 million Btu. The DHW subsystem provided an electrical energy savings of 0.11 million Btu, while the space heating subsystem contributed an electrical energy savings of 1.8 million Btu.

III. ACTION STATUS

No action is required at this time.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT SITE SUMMARY

SITE: J.D. EVANS, INC. HOUSE A, COLUMBIA, MARYLAND
REPORT PERIOD: DECEMBER, 1978

SOLAR/1012-78/12

SITE/SYSTEM DESCRIPTION: THE INSTALLATION CONSISTS OF TWO ADJACENT BUT SEPARATE RESIDENCES USING A SINGLE J-BOX AND SOAS. THE TWO HOUSES HAVE IDENTICAL AND INDEPENDENT SOLAR ASSISTED SYSTEMS. A LIQUID COLLECTOR TRANSFERS SOLAR HEAT TO A 1000 GALLON STORAGE TANK. A HEAT EXCHANGER IN THE STORAGE TANK PREHEATS DOMESTIC HOT WATER. STORAGE WATER IS CIRCULATED TO AN INDUCTIVE HEAT EXCHANGER FOR SPACE HEATING. RESISTANCE HEATING AND A HEAT PUMP, WHICH SUPPLIES SOME HEAT AND ALL COOLING, COMPLETE THE SYSTEM. ALL AUXILIARY ENERGY USED IS ELECTRIC.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	11.623	MILLION BTU
COLLECTED SOLAR ENERGY	33210	BTU/SQ. FT.
AVERAGE AMBIENT TEMPERATURE	3.937	MILLION BTU
AVERAGE BUILDING TEMPERATURE	11251	BTU/SQ. FT.
ECSS SOLAR CONVERSION EFFICIENCY	37	DEGREES F
ECSS OPERATING ENERGY	68	DEGREES F
TOTAL SYSTEM OPERATING ENERGY	0.28	MILLION BTU
TOTAL ENERGY CONSUMED	0.187	MILLION BTU
	0.926	MILLION BTU
	9.041	MILLION BTU

SUBSYSTEM SUMMARY:

LOAD	HOT WATER	HEATING	COOLING
SOLAR FRACTION USED	0.477	11.547	N.A.
SOLAR ENERGY USED	0.112	28	N.A.
OPERATING ENERGY	N.A.	3.175	N.A.
AUX. THERMAL ENERGY	0.495	0.762	N.A.
AUX. ELECTRIC FUEL	0.495	2.696	N.A.
AUX. FOSSIL FUEL	N.A.	3.856	N.A.
ELECTRICAL SAVINGS	0.112	N.A.	N.A.
FOSSIL SAVINGS	N.A.	1.761	N.A.

SYSTEM PERFORMANCE FACTOR:

C.67

* DENOTES UNAVAILABLE DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT
OF THE NATIONAL SOLAR DATA PROGRAM, FEBRUARY 28, 1978,
SOLAR/0004-78/18
READ THIS BEFORE TURNING PAGE

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT SITE SUMMARY

SITE: J.D. EVANS, INC. HOUSE A, COLUMBIA, MARYLAND
REPORT PERIOD: DECEMBER, 1978

SOLAR/1012-78/12

SITE/SYSTEM DESCRIPTION: OF TWO ADJACENT BUT SEPARATE RESIDENCES USING THE INSTALLATION CONSISTS OF TWO HOUSES HAVE IDENTICAL AND INDEPENDENT A SINGLE J-BOX AND SCAS. THE TWO HOUSES HAVE IDENTICAL AND INDEPENDENT SOLAR ASSISTED SYSTEMS. A LIQUID COLLECTOR TRANSFERS SOLAR HEAT TO A 1000 GALLON STORAGE TANK. A HEAT EXCHANGER IN THE STORAGE TANK PREHEATS DOMESTIC HOT WATER. STORAGE WATER IS CIRCULATED TO AN INDUCTIVE HEAT EXCHANGER FOR SPACE HEATING. RESISTANCE HEATING AND A HEAT PUMP, WHICH SUPPLIES SOME HEAT AND ALL COOLING, COMPLETE THE SYSTEM. ALL AUXILIARY ENERGY USED IS ELECTRIC.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	12.263	GIGA JOULES
COLLECTED SOLAR ENERGY	377143	KJ/SQ.M.
	4.154	GIGA JOULES
	127769	KJ/SQ.M.
	3	DEGREES C
	20	DEGREES C
	0.28	GIGA JOULES
	0.198	GIGA JOULES
	0.977	GIGA JOULES
	9.538	GIGA JOULES

SUBSYSTEM SUMMARY:

LOAD	HOT WATER	HEATING	COOLING
SOLAR FRACTION USED	0.503	12.182	N.A.
OPERATING ENERGY	0.119	3.350	N.A.
AUX. THERMAL ENG	0.522	0.804	N.A.
AUX. ELECTRIC FUEL	0.522	2.848	N.A.
AUX. FOSSIL SAVINGS	0.119	4.068	N.A.
FOSSIL SAVINGS	N.A.	1.858	N.A.
		N.A.	N.A.

SYSTEM PERFORMANCE FACTOR:

0.67

DENOTES UNAVAILABLE DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT
OF THE NATIONAL SOLAR DATA PROGRAM, FEBRUARY 28, 1978,
SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT COLLECTOR ARRAY PERFORMANCE

SITE: J.D. EVANS, INC. HOUSE A, COLUMBIA, MARYLAND SOLAR/1012-78/12
REPORT PERIOD: DECEMBER, 1978

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	0.562	0.509	0.235	45	0.419
2	0.309	0.238	0.090	52	0.292
3	0.309	0.000	0.000	43	0.000
4	0.118	0.088	0.029	66	0.250
5	0.263	0.187	0.065	48	0.249
6	0.582	0.533	0.250	53	0.430
7	0.214	0.135	0.039	53	0.184
8	0.100	0.053	0.005	60	0.055
9	0.016	0.000	0.000	46	0.000
10	0.604	0.529	0.199	46	0.330
11	0.726	0.627	0.273	30	0.376
12	*	*	*	*	*
13	0.600	0.526	0.221	47	0.368
14	0.562	0.463	0.175	34	0.313
15	0.385	0.341	0.153	44	0.399
16	0.532	0.488	0.223	53	0.419
17	0.503	0.409	0.147	41	0.293
18	0.534	0.472	0.201	43	0.377
19	0.140	0.019	0.004	36	0.029
20	0.018	0.000	0.000	31	0.000
21	0.407	0.359	0.140	45	0.344
22	0.591	0.526	0.217	40	0.368
23	0.458	0.459	0.197	44	0.374
24	0.031	0.000	0.000	36	0.000
25	0.291	0.400	0.157	42	0.343
26	0.615	0.544	0.086	42	0.297
27	0.628	0.561	0.201	30	0.328
28	0.576	0.513	0.222	29	0.354
29	0.237	0.187	0.050	36	0.381
30	0.016	0.000	0.000	36	0.213
31	0.016	0.000	0.000	36	0.000
SUM	11.623	9.711	3.937	-	-
AVG	0.374	0.313	0.127	42	0.339
NBSID	Q001		G100		N100

* DENOTES UNAVAILABLE DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: J.D. EVANS, INC. HOUSE A, COLUMBIA, MARYLAND

SOLAR/1012-78/12

REPORT PERIOD: DECEMBER, 1978

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TC LOADS MILLION BTU	AUX THERMAL TC ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	0.562	38	NOT APPLICABLE	NOT APPLICABLE	0.009	NOT APPLICABLE	0.171
2	0.309	41			0.006		0.435
3	0.089	42			0.000		0.608
4	0.118	56			0.005		0.009
5	0.263	43			0.006		0.246
6	0.582	42			0.009		0.102
7	0.214	45			0.004		0.611
8	0.100	47			0.005		0.338
9	0.016	46			0.000		0.300
10	0.604	26			0.008		0.300
11	0.726	24			0.010		0.242
12	* 0.600	* 39			*		0.242
13	0.562	39	NOT APPLICABLE	NOT APPLICABLE	0.008	NOT APPLICABLE	0.129
14	0.385	38			0.007		0.391
15	0.532	33			0.006		0.329
16	0.503	40			0.008		0.229
17	0.534	40			0.006		0.268
18	0.140	40			0.007		0.376
19	0.018	33			0.001		0.892
20	0.407	33			0.000		0.044
21	0.591	32			0.006		0.174
22	0.528	33			0.008		0.236
23	0.458	34			0.008		0.325
24	0.291	38			0.000		0.728
25	0.615	36			0.004		0.135
26	0.291	38			0.008		0.344
27	0.628	24			0.008		0.197
28	0.576	24			0.008		0.299
29	0.237	30			0.008		0.294
30	0.016	37			0.006		0.582
31	0.016	37			0.000		0.323
SUM	11.623	-	N.A.	N.A.	0.187	N.A.	-
AVG	0.374	37	N.A.	N.A.	0.006	N.A.	0.280
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT STORAGE PERFORMANCE

SITE: J.D. EVANS, INC. HCUSE A, CCLUMBIA, MARYLAND SOLAR/1012-78/12
REPORT PERIOD: DECEMBER, 1978

DAY OF MCH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORFD ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.235	C.096	C.090	100	0.792
2	C.090	C.134	-0.080	98	0.605
3	0.000	C.054	-0.062	88	1.000
4	0.029	0.001	-0.022	87	0.800
5	0.065	0.064	-0.002	91	0.953
6	0.250	C.059	-C.150	100	0.838
7	0.039	0.131	-0.121	98	0.236
8	0.005	C.034	-C.027	89	1.143
9	0.000	C.005	-0.009	88	1.000*
10	C.199	C.005	-0.032	95	0.825*
11	0.273	C.175	C.049	92	0.807
12	*	*	*	97	0.843
13	0.221	C.077	0.101	97	0.819
14	0.175	C.077	-C.053	92	0.882
15	0.153	0.126	-0.000	97	0.779
16	0.223	C.121	-C.074	101	0.834
17	0.147	0.135	-C.020	97	3.730
18	0.201	0.201	-0.032	85	1.000
19	C.004	C.124	-C.109	82	0.938
20	0.000	C.000	-0.001	89	0.889
21	C.140	C.070	0.060	94	0.901
22	0.197	C.139	-C.053	95	1.000
23	0.197	0.171	-C.026	84	0.839
24	C.000	C.117	-C.127	88	0.740
25	0.157	C.061	-C.069	87	0.984
26	0.186	C.100	-C.036	93	0.828
27	0.201	C.121	-C.077	95	0.803
28	0.222	0.187	-0.006	86	0.445
29	0.219	C.169	-C.115	79	1.000
30	0.050	C.138	-C.115		
31	0.000	0.005	-0.008		
SUM	3.937	3.258	-C.018	-	-
AVG	0.127	C.105	0.000	92	0.823
NBS ID	Q200	G201	G202		N103

* DENOTES UNAVAILABLE DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT HCT WATER SUBSYSTEM

SITE: J.D. EVANS, INC. HOUSE A, COLUMBIA, MARYLAND
REPORT PERIOD: DECEMBER, 1978
SOL AR/1012-78/12

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR. OF LOAD PER.	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HCT WATER USED GAL
1	0.024	116	0.007	0.027	0.009	0.027		0.007		59	139	358
2	0.005	117	0.002	0.009	0.010	0.009		0.002		56	144	127
3	0.008	115	0.001	0.010	0.010	0.010		0.001		59	142	127
4	0.004	118	0.003	0.011	0.008	0.008		0.003		54	141	256
5	0.018	15	0.001	0.008	0.015	0.015		0.001		60	141	198
6	0.004	20	0.003	0.010	0.010	0.010		0.003		61	142	36*
7	0.013	16	0.001	0.029	0.010	0.010		0.001		59	141	18*
8	0.005	16	0.005	0.010	0.016*	0.016*		0.005		57	14*	135
9	0.026*	13*	0.002*	0.016*	0.014	0.014		0.002*		56	141	155
10	0.013*	13*	0.002*	0.016*	0.014	0.014		0.002*		53	142	140
11	0.010	16	0.003	0.014	0.014	0.014		0.003		55	142	288
12	0.010	15	0.003	0.014	0.014	0.014		0.003		53	142	187
13	0.011	20	0.008	0.015	0.015	0.015		0.008		55	142	126
14	0.029	17	0.001	0.012	0.012	0.012		0.001		54	142	438
15	0.006	25	0.002	0.015	0.015	0.015		0.002		52	142	27
16	0.012	20	0.000	0.011	0.011	0.011		0.000		56	141	104
17	0.008	14	0.001	0.011	0.011	0.011		0.001		55	141	620
18	0.004	11	0.000	0.010	0.010	0.010		0.000		54	142	20
19	0.008	11	0.000	0.010	0.010	0.010		0.000		54	142	14
20	0.012	16	0.004	0.028	0.028	0.028		0.004		54	142	20
21	0.004	19	0.004	0.027	0.027	0.027		0.004		53	144	653
22	0.021	17	0.003	0.021	0.021	0.021		0.003		54	143	21
23	0.020	45	0.014	0.006	0.006	0.006		0.014		58	141	N308
24	0.068	31	0.000	0.017	0.017	0.017		0.000		54	140	
25	0.015	23	0.003	0.017	0.017	0.017		0.003		52	142	
26	0.010	21	0.003	0.014	0.014	0.014		0.003		59	143	
27	0.015	17	0.002	0.019	0.019	0.019		0.002		57	141	
28	0.477	-	0.112	0.495	0.495	0.495	N.A.	0.112	N.A.	-	-	
29	0.015	22	0.003	0.015	0.015	0.015	N.A.	0.003	N.A.	56	142	
30	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q213	N305	N307	
31												
SUM												
AVG												
NBS												

* DENOTES UNAVAILABLE DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT SPACE HEATING SUBSYSTEM

SOLAR/1012-78/12

SITE: J.D. EVANS, INC. HOUSE A, COLUMBIA, MARYLAND
REPORT PERIOD: DECEMBER, 1978

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR. OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.263	34	0.088	0.015	0.054	0.078		0.042		68	38
2	0.132	100	0.132	0.016	0.000	0.000		0.066		68	41
3	0.326	16	0.052	0.017	0.082	0.117		0.022		68	42
4	0.143	0	0.006	0.006	0.041	0.059		0.000		67	56
5	0.243	21	0.050	0.012	0.057	0.080		0.021		68	43
6	0.232	25	0.058	0.012	0.056	0.080		0.026		68	44
7	0.127	100	0.127	0.014	0.000	0.007		0.059		68	45
8	0.050	65	0.032	0.014	0.004	0.007		0.120		68	57
9	0.250	0	0.000	0.031	0.079	0.112		0.000		68	46
10	0.496	28	0.141	0.031	0.123	0.176		0.092		67	26
11	0.593	29	0.173	0.039	0.157	0.224		0.106		67	2
12	0.389	19	0.075	0.020	0.106	0.152		0.030		7	39
13	0.305	71	0.215	0.026	0.029	0.042		0.121		68	31
14	0.364	34	0.115	0.024	0.075	0.107		0.057		68	33
15	0.172	66	0.113	0.022	0.018	0.026		0.056		68	40
16	0.284	45	0.126	0.018	0.048	0.068		0.098		68	40
17	0.359	56	0.199	0.029	0.046	0.067		0.066		67	33
18	0.332	23	0.122	0.033	0.130	0.186		0.000		67	33
19	0.791	0	0.000	0.032	0.256	0.365		0.035		67	43
20	0.396	18	0.065	0.019	0.056	0.138		0.077		67	33
21	0.459	30	0.138	0.027	0.105	0.150		0.098		67	33
22	0.327	50	0.163	0.033	0.049	0.071		0.063		67	33
23	0.551	20	0.057	0.027	0.140	0.200		0.030		67	38
24	0.347	128	0.096	0.032	0.079	0.113		0.047		68	36
25	0.554	19	0.106	0.032	0.151	0.216		0.069		68	28
26	0.481	33	0.186	0.036	0.102	0.147		0.128		68	24
27	0.458	36	0.166	0.035	0.103	0.147		0.117		68	24
28	0.420	33	0.166	0.037	0.092	0.131		0.085		68	30
29	0.420	33	0.166	0.037	0.092	0.131		0.085		68	30
30	0.420	33	0.166	0.037	0.092	0.131		0.085		68	30
31	0.549	1	0.003	0.020	0.170	0.243		0.001		68	37
SUM	11.547	-	3.175	0.762	2.699	3.856	N.A.	1.761	N.A.	-	-
AVG	0.372	28	0.102	0.024	0.087	0.124	N.A.	0.056	N.A.	68	37
NRS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DFNOTES UNAVAILABLE DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SCLAR HEATING AND CCCLING DEMCNSTRATION PROGRAM

MONTHLY REPORT ENVIRONMENTAL SUMMARY

SOLAR/1012-78/12

HOUSE A, COLUMBIA, MARYLAND

SITE: J.D. EVANS, INC.
REPORT PERIOD: DECEMBER, 1978

DAY OF MONTH	TOTAL INSOLATION BTU/SQ. FT	DIFFUSE INSOLATION BTU/SQ. FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	1607		38	45	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE
2	886		41	52			
3	256		42	43			
4	338		56	66			
5	753		43	48			
6	1664		42	53			
7	614		45	53			
8	287		57	60			
9	48		46	48			
10	1728		24	30			
11	2075		*9	*7			
12	1715		33	47			
13	1607		31	34			
14	1102		38	44			
15	1520		33	53			
16	1438		40	41			
17	1526		40	43			
18	400		33	36			
19	53		33	31			
20	1166		43	45			
21	1689		33	40			
22	1510		33	44			
23	90		35	46			
24	1309		38	42			
25	834		28	42			
26	1758		36	42			
27	1797		24	30			
28	1647		24	29			
29	677		30	30			
30	46		37	36			
31							
SUM	33211	N.A.	-	-	-	-	-
AVG	1071	N.A.	37	42	N.A.	N.A.	N.A.
NBS ID	Q001		N113			N115	N114

* DENOTES UNAVAILABLE DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

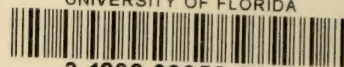
MONTHLY REPORT THERMODYNAMIC CONVERSION EQUIPMENT

SITE: J.D. EVANS, INC. HOUSE A, COLUMBOLAR/1012-78/12
REPORT PERIOD: DECEMBER, 1978 REPORT DATE: 29 MARCH 1979

DAY OF MONTH	EQUIPMENT LOAD MILLION BTU	THERMAL ENERGY INPUT MILLION BTU	OPERATING ENERGY MILLION BTU	ENERGY REJECTED MILLION BTU	COEFFICIENT OF PERFORMANCE (SEE NOTE)
1	0.175	0.078	NOT APPLICABLE	NOT APPLICABLE	0.000
2	0.000	0.000			0.000
3	0.274	0.117			0.000
4	0.145	0.055			0.000
5	0.192	0.082			13.217
6	0.174	0.080			0.000
7	0.000	0.000			0.000
8	0.017	0.007			0.000
9	0.250	0.112			0.000
10	0.355	0.176			27.474
11	0.419	0.224			0.000
12	*	*			*
13	0.314	0.152	NOT APPLICABLE	NOT APPLICABLE	0.000
14	0.089	0.042			0.000
15	0.239	0.107			0.000
16	0.059	0.026			0.000
17	0.157	0.068			0.000
18	0.160	0.067			0.000
19	0.409	0.186			0.000
20	0.791	0.365			0.000
21	0.327	0.138			0.000
22	0.321	0.150			0.000
23	0.161	0.071			0.000
24	0.454	0.200			0.000
25	0.250	0.116			0.000
26	0.448	0.216			0.000
27	0.295	0.147			45.329
28	0.292	0.147			0.000
29	0.285	0.131			0.000
30	0.285	0.131			0.000
31	0.546	0.243			0.000
SUM	8.371	3.856	*	*	-
AVG	0.270	0.124	*	*	216.768

* DENOTES UNAVAILABLE DATA.
NOTE:

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